

(19)日本国特許庁(JP)

(12) 公開特許公報(A)

(11)特許出願公開番号

特開平5-250636

(43)公開日 平成5年(1993)9月28日

(51)Int.Cl.<sup>5</sup>

G 1 1 B 5/31

識別記号

庁内整理番号

F I

技術表示箇所

F 7247-5D

G 7247-5D

審査請求 未請求 請求項の数5(全11頁)

(21)出願番号 特願平4-46572

(22)出願日 平成4年(1992)3月4日

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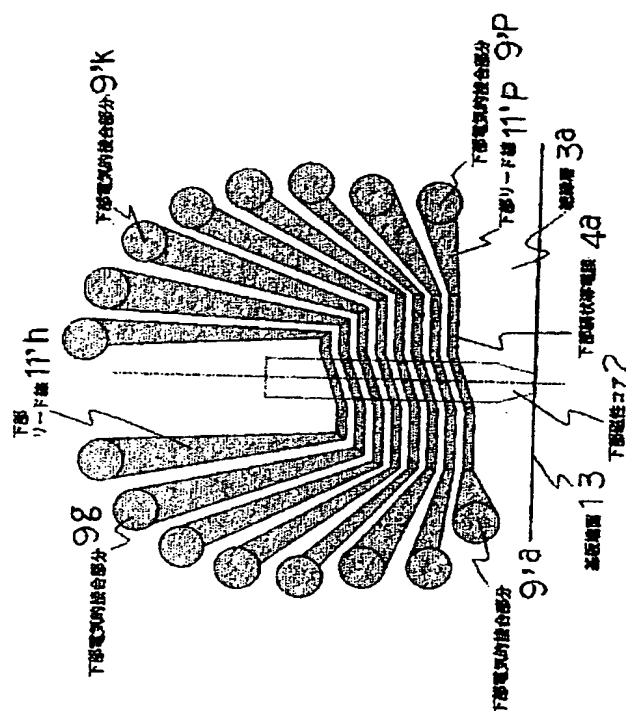
(54)【発明の名称】 薄膜磁気ヘッド

(57)【要約】

【目的】 量産に適し、信頼性の高い薄膜磁気ヘッドを得る

【構成】 基板1上に下部磁性コアを被着形成し、下部磁性コアの上に絶縁層2aを介して下部縞状導電膜6を形成し、下部縞状導電膜6の上に絶縁層2bを介して上部磁性コア4を形成し、上部磁性コア4の上に絶縁層3aを介して上部縞状導電膜7を形成し、下部縞状導電膜6及び上部縞状導電膜7の端部は連結されてヘリカル状導体コイルが形成される薄膜磁気ヘッドであって、下部縞状導電膜6と前記上部縞状導電膜7を電氣的に連結する電氣的接合部分の幅が上部及び下部の縞状導電膜6、7の磁性コア4に重なる部分の幅より大きい薄膜磁気ヘッド。

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## 【特許請求の範囲】

【請求項1】 基板上に下部磁性コアを被着形成し、前記下部磁性コアの上に絶縁層を介して下部縞状導電膜を形成し、前記下部縞状導電膜の上に絶縁層を介して上部磁性コアを形成し、前記上部磁性コアの上に絶縁層を介して上部縞状導電膜を形成し、前記下部縞状導電膜及び上部縞状導電膜の端部は連結されてヘリカル状導体コイルが形成される薄膜磁気ヘッドにおいて、前記下部縞状導電膜と前記上部縞状導電膜を電氣的に連結する電氣的接合部分の幅が前記上部及び下部の縞状導電膜の磁性コアに重なる部分の幅より大きいことを特徴とする薄膜磁気ヘッド。

【請求項2】 基板上に下部縞状導電膜を被着形成し、前記下部縞状導電膜の上に絶縁層を介して下部磁性コアを形成し、前記下部磁性コアの上に絶縁層を介して上部縞状導電膜を形成し、前記上部縞状導電膜の上に絶縁層を介して上部磁性コアを形成し、前記下部縞状導電膜及び上部縞状導電膜の端部は連結されてヘリカル状導体コイルが形成される薄膜磁気ヘッドにおいて、前記下部縞状導電膜と前記上部縞状導電膜を電氣的に連結する電氣的接合部分の幅が前記上部及び下部の縞状導電膜の磁性コアに重なる部分の幅より大きいことを特徴とする薄膜磁気ヘッド。

【請求項3】 請求項1あるいは請求項2において、前記電氣的接合部分は下部及び上部リード線により前記上部及び下部の縞状導電膜に連結されていることを特徴とする薄膜磁気ヘッド。

【請求項4】 請求項3において、前記下部及び上部リード線の幅が前記上部及び下部の縞状導電膜の磁性コアに重なる部分の幅より大きいことを特徴とする薄膜磁気ヘッド。

【請求項5】 請求項3あるいは請求項4において、前記下部リード線及び上部リード線は絶縁層を介して重なるように配されていることを特徴とする薄膜磁気ヘッド。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は構造が簡単で製造し易い高性能な薄膜磁気ヘッドに関する。

## 【0002】

【従来の技術】 従来、薄膜磁気ヘッドは、基板上に薄膜堆積法、フォトリソグラフィ技術等を用いて磁性コア、導体コイルを絶縁層を介して形成するものであり、従来のバルク型のヘッドに比べて小型化、高性能化が容易である。従来の薄膜磁気ヘッドは、図7に示すように、下部磁性コア(4')上に絶縁層(3'a)を介してスパイラル状導体コイル(12')が被着形成されており、該導体コイル上に絶縁層(3'b)を介して上部磁性コア(6')が被着形成されている。上述のようなスパイラル状導体コイル(12')を有する薄膜磁気ヘッドは、製造が容易であるが、

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導体コイルの占める面積が大きくなり、ヘッドを組み立てる際には、小型実装の面で不利である。また、スパイラル状導体コイル(12')に流れる電流から発生する磁束は、下部及び上部の磁性コア(4')(6')の高透磁率性を利用することによりy方向の成分となりヘッドギャップ(5')に導かれる。しかし、このときのコイルによる磁界は、図7のHxに示すように、反磁界の大きい磁性コアの膜面に垂直なx方向であり、磁性コアを飽和まで到達させるにはかなり大きな起磁力が必要である。さらに、スパイラル状導体(12')と磁性コア(4')(6')の重なっている部分の面積比率がきわめて少なく、導体コイルと磁性コアの結合状態という点から見れば、図7の従来のスパイラル状導体コイルの構造は好ましい構造ではない。これに対して、図8に示されているようなヘリカル状導体コイル(7')を有する薄膜磁気ヘッドでは、導体コイルの占める面積が小さく、小型実装に適している。また、ヘリカル状の導体コイル(7')に流れる電流から発生する磁界は、図8のHyに示すように、反磁界の小さい上部磁性コア(6')の膜面内のy方向を向いており、小さい起磁力で磁気記録に充分な磁界をヘッドギャップ(5')に発生させることができる。さらに、ヘリカル状導体コイルではコイルと磁性コアの重なる部分の面積比率がきわめて大きく、両者の結合効率がきわめて高いという大きな利点を持っている。しかし、1ターンの導体コイルを形成するのに、導体層の形成、エッチングによる形状加工、絶縁層の形成、スルーホール加工という複雑な工程が必要であること、多数巻の導体コイルを作製する場合、図8の電氣的接合部分(9')に示すように面積の小さい接続箇所が多くなり、信頼性の面でも問題があることが欠点とされてきた。

## 【0003】

【発明が解決しようとする課題】 本発明は上記従来例の欠点を鑑みなされたものであり、量産性に適し、しかも信頼性の高い薄膜磁気ヘッドを提供することを目的とするものである。

## 【0004】

【課題を解決するための手段】 本発明は、基板上に下部磁性コアを被着形成し、前記下部磁性コアの上に絶縁層を介して下部縞状導電膜を形成し、前記下部縞状導電膜の上に絶縁層を介して上部磁性コアを形成し、前記上部磁性コアの上に絶縁層を介して上部縞状導電膜を形成し、前記下部縞状導電膜及び上部縞状導電膜の端部は連結されてヘリカル状導体コイルが形成される薄膜磁気ヘッドにおいて、前記下部縞状導電膜と前記上部縞状導電膜を電氣的に連結する電氣的接合部分の幅が前記上部及び下部の縞状導電膜の磁性コアに重なる部分の幅より大きいことを特徴としている。

## 【0005】

【作用】 上記構成によれば、図8の従来構造の電氣的接合部分(9')に比較して大きな面積で下部及び上部縞状導

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電膜を電氣的に接合できるので、量産性に適した信頼性の高い薄膜磁気ヘッドを実現できる。

【0006】

【実施例】以下、図面を参照しつつ本発明の実施例を詳細に説明する。図1(a)は本発明の一つの実施例を示す薄膜磁気ヘッドの平面図、図1(b)は平面図(a)におけるA-A'線に沿った断面図、図1(c)は平面図(a)におけるB-B'断面図である。図中、(1)はMn-ZnフェライトやNi-Znフェライト等の強磁性酸化物材料、あるいは結晶化ガラス等の非磁性セラミックスからなる基板であり、該基板(1)の上にはパーマロイ、センダスト、Co系アモルファス磁性合金等の高透磁率磁性薄膜よりなる下部磁性コア(2)が被着形成されている。前記下部磁性コアの上にはSiO<sub>2</sub>等の絶縁材料よりなる絶縁層(3a)を介してCu、Al等の導電材料よりなる約2μm厚の下部縞状導電膜(4)が形成されている。該下部縞状導電膜(4)の上には約1μm厚の絶縁層(3b)が形成されている。前記の絶縁膜(3b)の上には高透磁率磁性薄膜よりなる上部磁性コア(5)が被着形成されている。前記上部磁性コア(5)は図に示すように、効率のよいヘッドギャップ(10)を形成するために、磁極の先端と磁性基板の間隔が狭くなるように作製されている。下部磁性コア(2)と上部磁性コア(5)の端面は基板(1)の端面と同一面に露出し、ヘッドギャップ(5)の磁極となっている。前記下部磁性コア(2)と上部磁性コア(5)の他方の端は、絶縁層(3)(6)の取り除かれた磁氣的接合部分(12)により磁氣的に接合されている。前記上部磁性コア(5)の上には約1μmの絶縁層(6a)を介して上部縞状導電膜(7)が形成されている。前記下部及び上部縞状導電膜(4)(7)は、上部磁性コア(5)を巻回するが、上部磁性コアの近傍ではお互いに端部は連結されず、下部及び上部リード線(11')(11)により上部及び下部磁性コアより離れた電氣的接合部分(9)で連結されてヘリカル状導体コイルとなる。このような構造を採用することにより、電氣的接合部分(9)は図8の従来構造に比較して幅にして4倍以上、面積で16倍以上にとることができた。これにより、ヘリカル状導体コイルの歩留り及び薄膜磁気ヘッドの信頼性が飛躍的に向上した。また、下部リード線(11')と上部リード線(11)は全く同じ形状をしており、この二つの導体により発生する磁界はお互いに打ち消しあうのでリード線を遠方に伸ばしたことによるインダクタンスの増加は最低限に抑えることができた。次に、上記実施例の薄膜磁気ヘッドの製造方法について説明する。先ず、基板(1)の上面に下部磁性コア(2)が蒸着、スパッタリング及びフォトリソグラフィ等の技術により被着形成される。次に、前記下部磁性コア(2)を備えた基板(1)の上面に絶縁層(3a)を平坦に形成する。次に、図2に示すように、下部縞状導電膜(4a)～(4h)、下部リード線(11'a)～(11'p)、下部接合部分(9'a)～(9'p)が、蒸着、スパッタリング及びフォトリソグラフィ等の技術により被着形成され

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る。この際、前記下部縞状導電膜(4)は、後工程で作製される上部縞状導電膜(7)と重なり、ヘリカル状導体コイルとなるように配されている。次に、前記下部縞状導電膜(4)、下部リード線(11')、下部接合部分(9')の上全域に絶縁層(3b)を平坦に形成する。次に、図3に示すように、エッチング加工によりスルーホール(14a)を作製し、前記下部磁氣的接合部分(12)となる下部磁性コア(2)の表面を露出させる。また、効率のよいヘッドギャップを作製するための加工も行われる。次に、前記下部磁性コア(2)とほぼ同じ形状をした上部磁性コア(5)が蒸着、スパッタリング及びフォトリソグラフィ等の技術により被着形成される。下部及び上部磁性コアはこのプロセスおよび磁氣的接合部分(12)で接合される。次に、前記上部磁性コア(5)を含む上面全域に絶縁層(3a)を平坦に形成する。次に、図4に示すように、エッチング加工によりスルーホール(14b)を作製し、前記下部電氣的接合部分(9')を露出させる。次に、図5に示すように、上部縞状導電膜(7a)～(7h)、上部リード線(11a)～(11p)、上部電氣的接合部分(9a)～(9p)、端子(8a)(8b)が、蒸着、スパッタリング及びフォトリソグラフィ等の技術により被着形成される。これにより、前記下部電氣的接合部分(9')と前記上部電氣的接合部分(9)は電氣的に接合され、前記下部縞状導電膜(4)と前記上部縞状導電膜(7)は電氣的につながり、ヘリカル状導体コイルとなる。次に、図1(b)(c)に示すように、保護のために全域表面に絶縁層(6b)を形成する。以上の工程により、本発明の一つの実施例が完成する。図6(a)は本発明のもう一つの実施例を示す薄膜磁気ヘッドの平面図、図6(b)は平面図(a)におけるA-A'線に沿った断面図、図6(c)は平面図(a)におけるB-B'断面図である。図中、(1)結晶化ガラス等の非磁性セラミックスからなる基板であり、該基板(1)の上にはCu、Al等の導電材料よりなる約2μm厚の下部縞状導電膜(4)が形成されている。前記下部縞状導電膜(4)の上には、SiO<sub>2</sub>等の絶縁材料よりなる絶縁層(3a)を介して、パーマロイ、センダスト、Co系アモルファス磁性合金等の高透磁率磁性薄膜よりなる下部磁性コア(2)が被着形成されている。前記下部磁性コアの上には約1μm厚の絶縁層(3b)が形成されている。前記絶縁層(3b)の上には上部縞状導電膜(7)が形成されている。該上部縞状導電膜(7)の上には前記の絶縁層(6a)を介して高透磁率磁性薄膜よりなる上部磁性コア(5)が被着形成されている。前記上部磁性コア(5)は図に示すように、効率のよいヘッドギャップ(10)を形成するために、磁極の先端と磁性基板の間隔が狭くなるように作製されている。下部磁性コア(2)と上部磁性コア(5)の端面は基板(1)の端面と同一面に露出し、ヘッドギャップ(10)の磁極となっている。前記下部磁性コア(2)と上部磁性コア(5)の他方の端は、絶縁層(3)(6)の取り除かれた磁氣的接合部分(12)により磁氣的に接合されている。図6の本実施例が図1の前実施例と異なる点は、前

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記下部及び上部導電膜(4)(7)が下部磁性コア(5)を巻回し、下部磁性コアの近傍ではお互いに端部は連結されず、下部及び上部リード線(11')(11)により上部及び下部磁性コアより離れた電氣的接合部分(9)で連結されてヘリカル状導体コイルとなることである。このような構造を採用することにより、前の実施例と同じように、ヘリカル状導体コイルの歩留り及び薄膜磁気ヘッドの信頼性が飛躍的に向上した。この実施例は、本発明の請求の範囲の基礎的事項である、電氣的接合部分及びリード線の幅が導上導電膜の磁性コアに重なる部分の幅より大きいという事項を含んでいることから、本分野の専門家であれば上記実施例が本発明の範囲に含まれることは容易に理解できるであろう。

【0007】

【発明の効果】本発明によれば、従来構造に比較し、製造が容易で量産性に適した高信頼性の薄膜磁気ヘッドを提供し得る。

【図面の簡単な説明】

【図1】薄膜磁気ヘッドの平面図及び断面図

【図2】薄膜磁気ヘッドの製造方法を示す平面図

【図3】薄膜磁気ヘッドの製造方法を示す平面図

【図4】薄膜磁気ヘッドの製造方法を示す平面図

【図5】薄膜磁気ヘッドの製造方法を示す平面図

【図6】薄膜磁気ヘッドの他の実施例を示す要部平面図

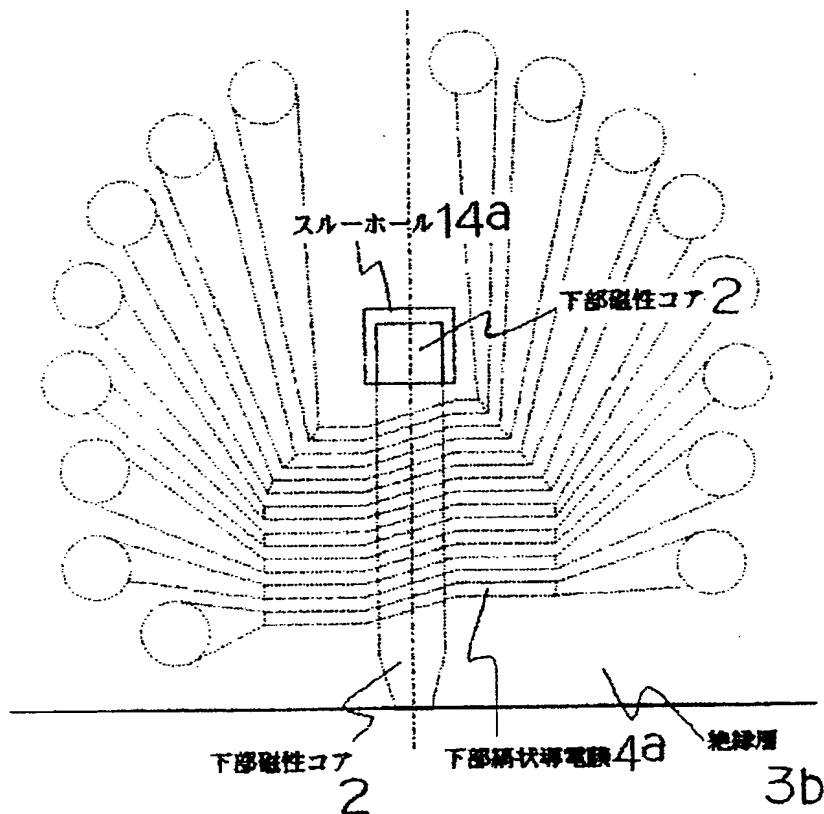
【図7】従来の薄膜ヘッドの平面図と断面図。

【図8】従来の薄膜ヘッドの平面図と断面図。

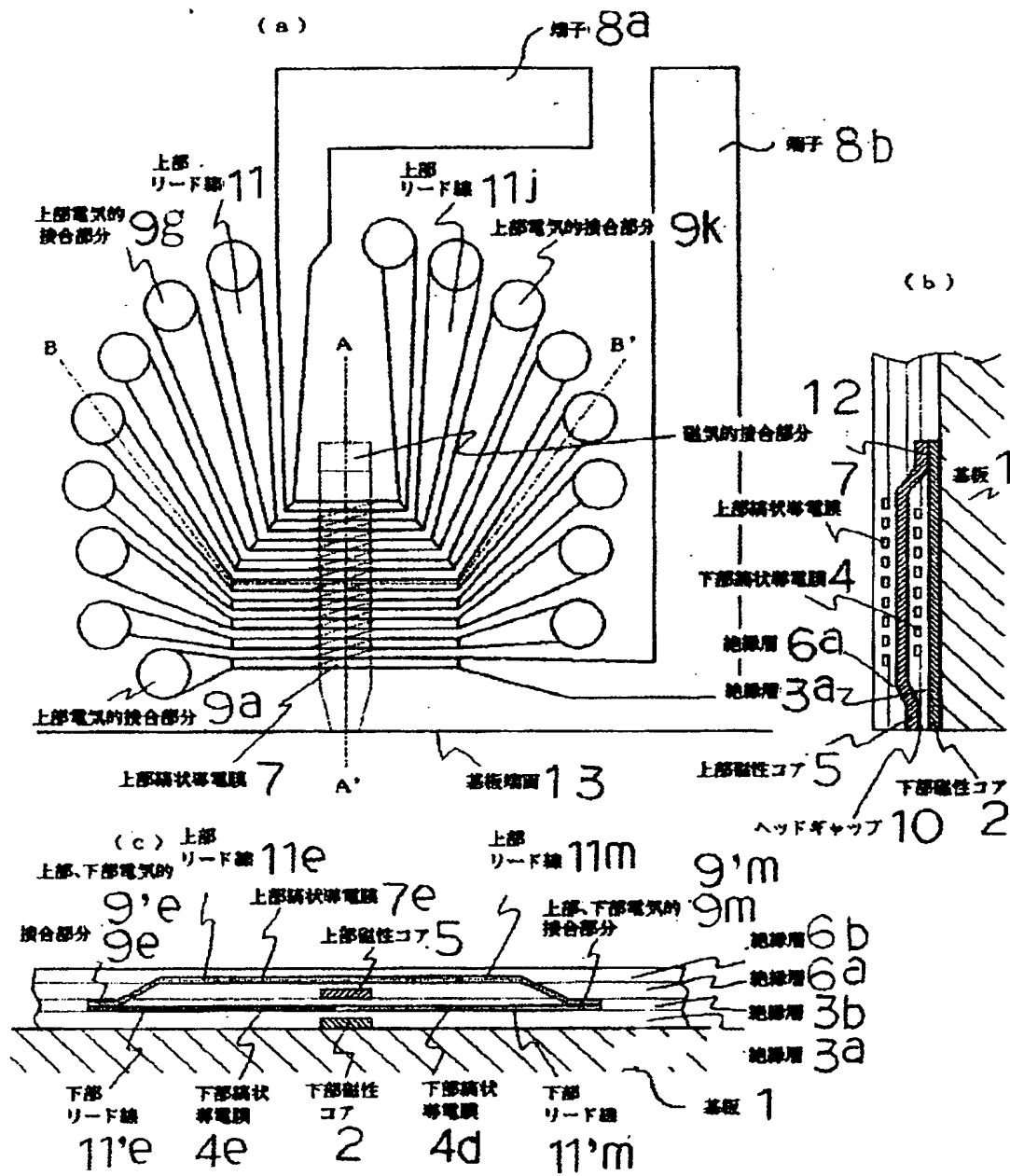
【符号の説明】

- 1 基板
- 2 下部磁性コア
- 3 絶縁層
- 4 下部縞状導電膜
- 5 上部磁性コア
- 6 絶縁層
- 7 上部縞状導電膜
- 7' ヘリカル状導体コイル
- 8 端子
- 9 電氣的接合部分
- 10 ヘッドギャップ
- 11 リード線
- 12 磁氣的接合部分
- 12' スパイラル状導体コイル
- 20 13 基板端面
- 14 スルーホール

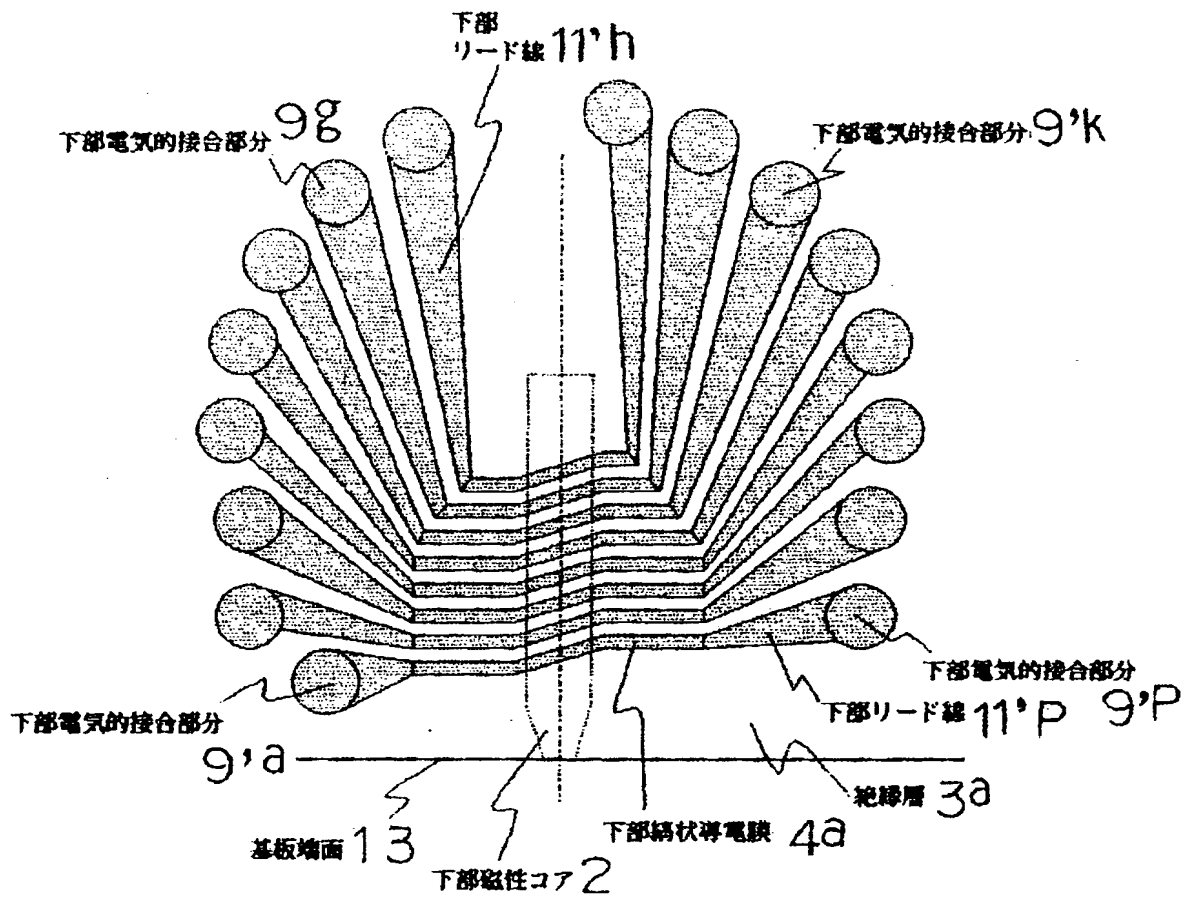
【図3】



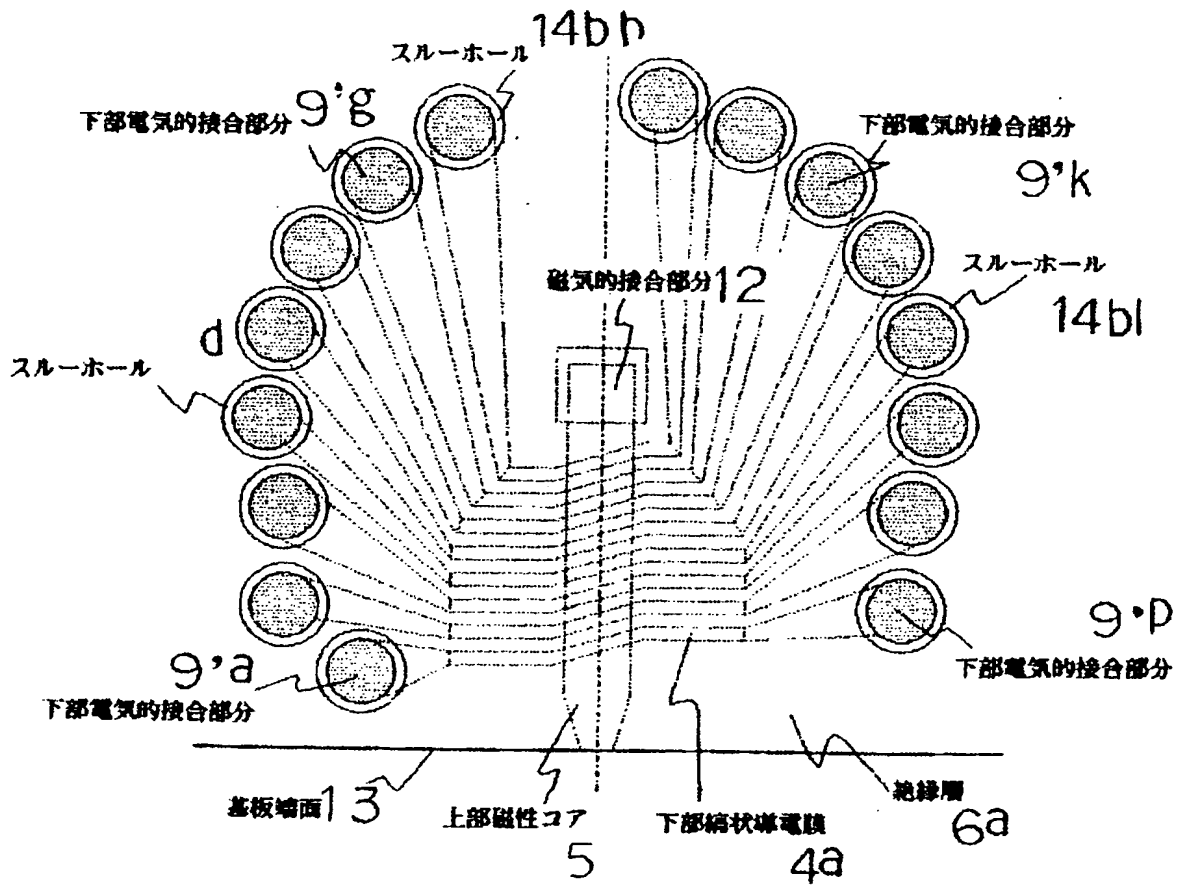
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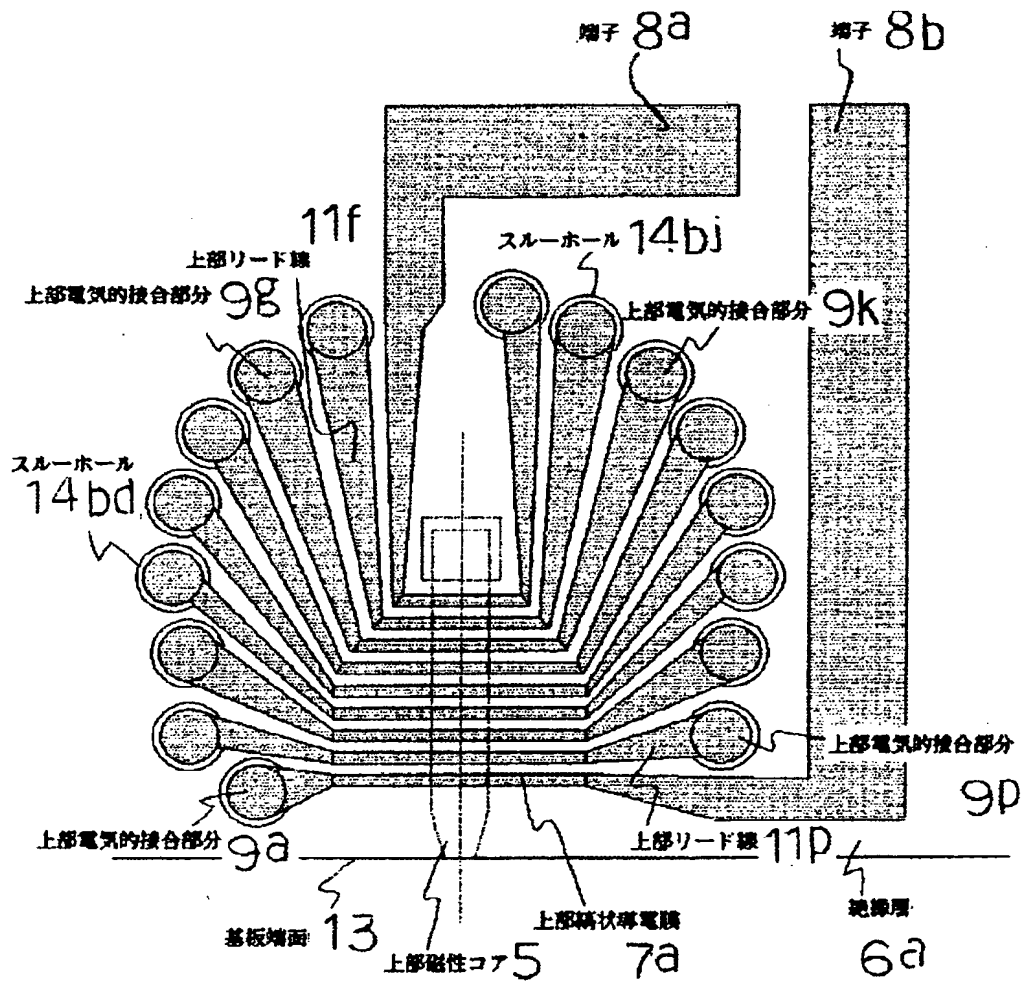
【図 2】



【図4】

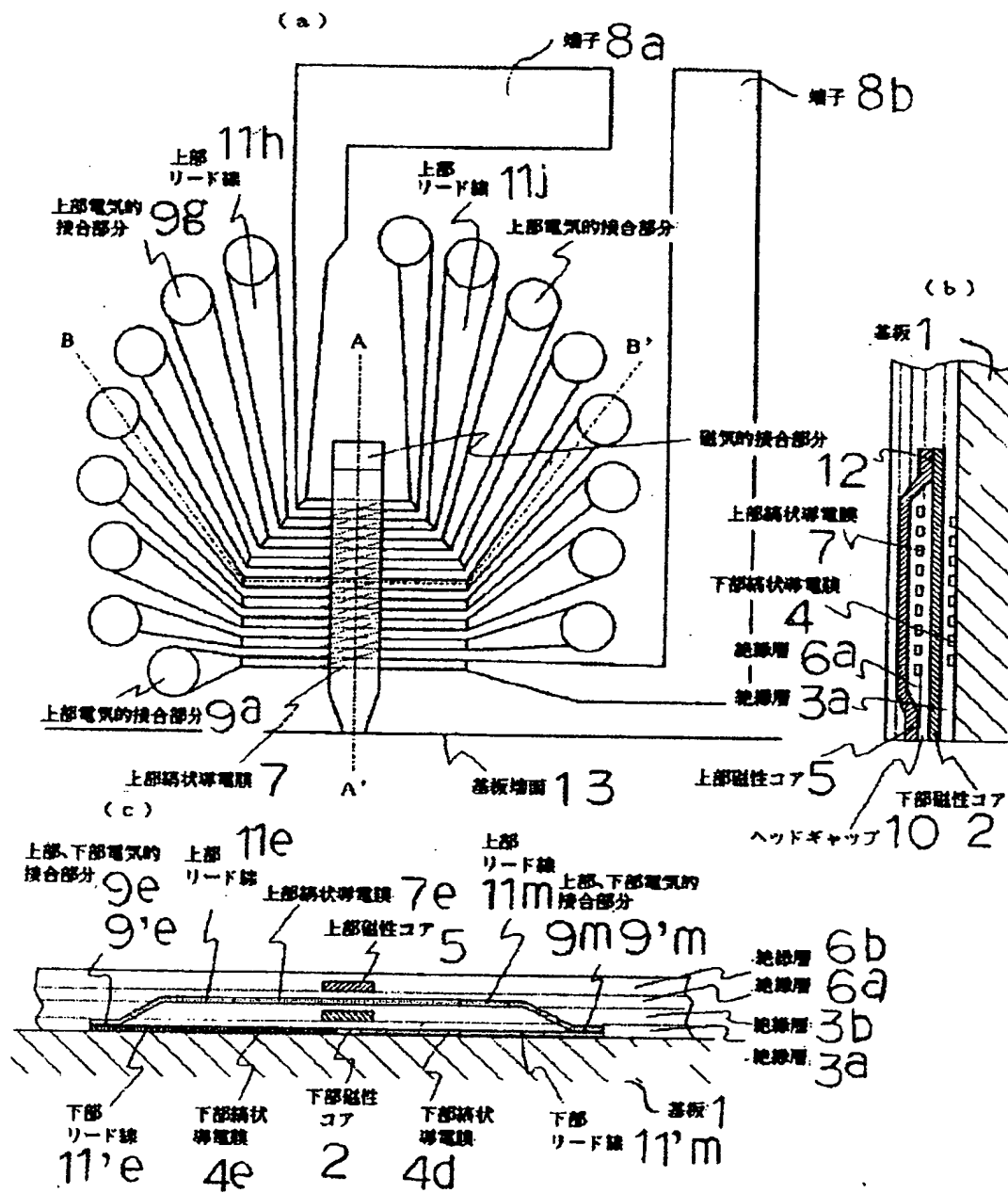


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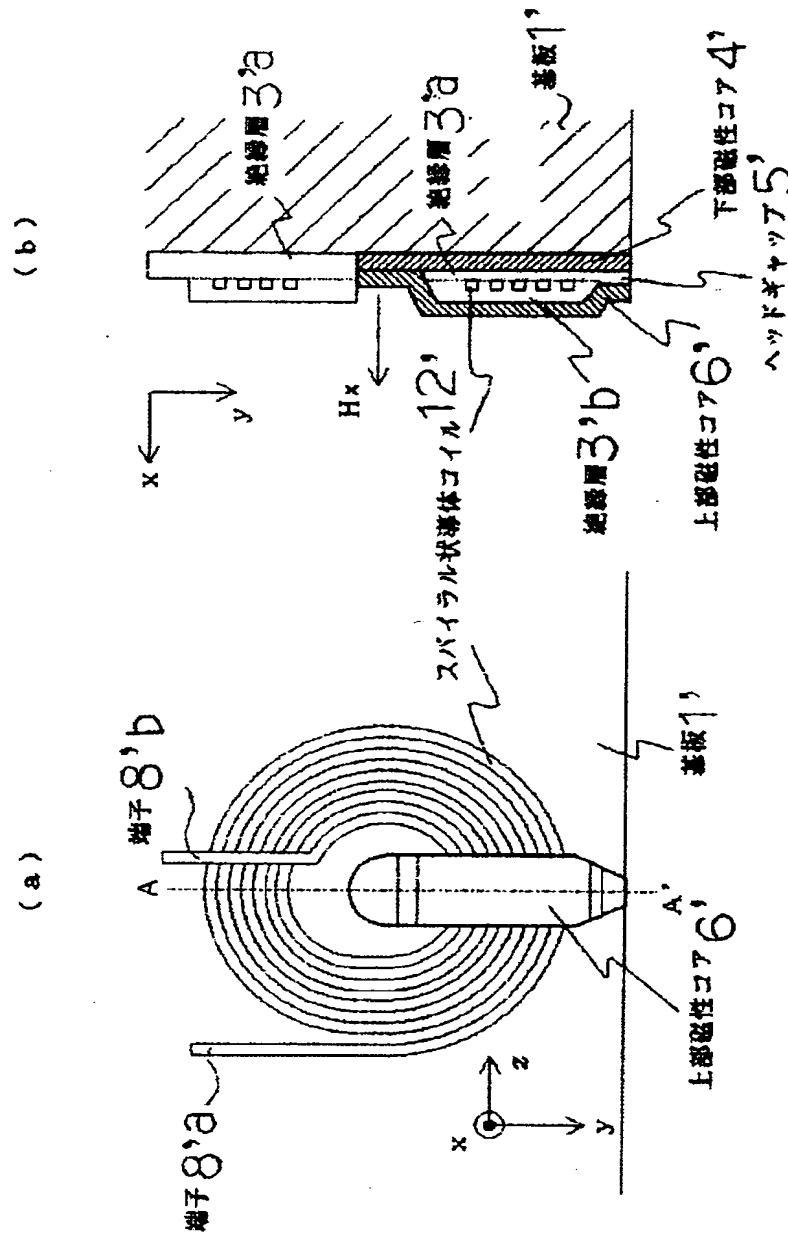




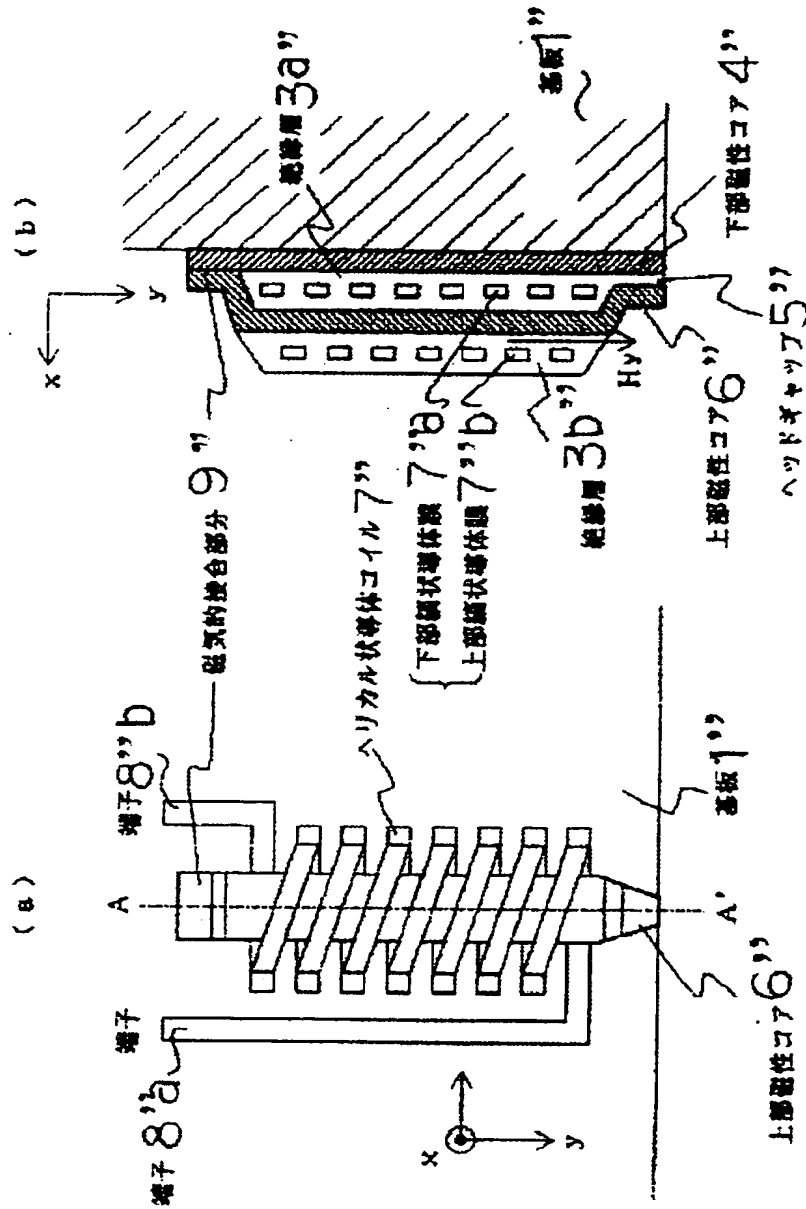
【図6】



【図7】



【図8】



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## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-250636

(43)Date of publication of application : 28.09.1993

(51)Int.Cl.

G11B 5/31

(21)Application number : 04-046572

(71)Applicant : HITACHI METALS LTD

(22)Date of filing : 04.03.1992

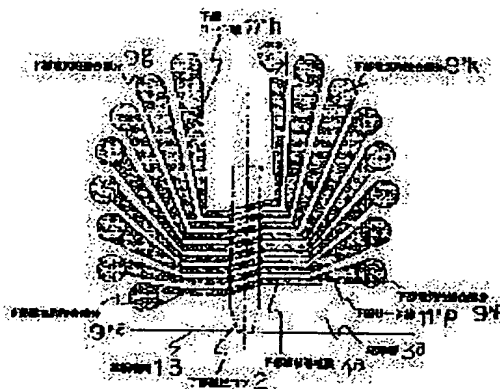
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### (54) THIN-FILM MAGNETIC HEAD

#### (57)Abstract:

**PURPOSE:** To obtain a thin-film magnetic head suitable for mass production and having high reliability.

**CONSTITUTION:** The thin-film magnetic head is produced by the following process. A lower magnetic core 2 is formed by deposition on a substrate 1, on which an insulating layer 2a and a lower stripe conductive film 6 are formed. And an insulating layer 2a and an upper magnetic core 4, further an insulating layer 3a and an upper stripe conductive film 7 are formed thereon. The end part of the lower stripe conductive film 6 and the end of the upper stripe conductive film 7 are connected to form a helical conductive coil. The electric connecting part between the upper and lower stripe conductive films 6, 7 is made wider than the overlapping area of the upper and lower stripe conductive films on the magnetic core 4.



### LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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[Claim(s)]

[Claim 1] Carry out covering formation of the lower magnetism core on a substrate, and a lower stripes-like electric conduction film is formed through an insulating layer on the aforementioned lower magnetism core. Form an up magnetism core through an insulating layer on the aforementioned lower stripes-like electric conduction film, and an up stripes-like electric conduction film is formed through an insulating layer on the aforementioned up magnetism core. In the thin film magnetic head in which a coil is formed the edge of the aforementioned lower stripes-like electric conduction film and an up stripes-like electric conduction film is connected — having — the shape of helical one — a conductor — The thin film magnetic head characterized by the width of face for the electric joint which connects electrically the aforementioned lower stripes-like electric conduction film and the aforementioned up stripes-like electric conduction film being larger than the width of face of the portion which laps with the magnetic core of the stripes-like electric conduction film of the aforementioned upper part and the lower part.

[Claim 2] Carry out covering formation of the lower stripes-like electric conduction film on a substrate, and a lower magnetism core is formed through an insulating layer on the aforementioned lower stripes-like electric conduction film. Form an up stripes-like electric conduction film through an insulating layer on the aforementioned lower magnetism core, and an up magnetism core is formed through an insulating layer on the aforementioned up stripes-like electric conduction film. In the thin film magnetic head in which a coil is formed the edge of the aforementioned lower stripes-like electric conduction film and an up stripes-like electric conduction film is connected — having — the shape of helical one — a conductor — The thin film magnetic head characterized by the width of face for the electric joint which connects electrically the aforementioned lower stripes-like electric conduction film and the aforementioned up stripes-like electric conduction film being larger than the width of face of the portion which laps with the magnetic core of the stripes-like electric conduction film of the aforementioned upper part and the lower part.

[Claim 3] It is the thin film magnetic head characterized by connecting a part for the aforementioned electric joint with the stripes-like electric conduction film of the aforementioned upper part and the lower part with the lower part and up lead wire in a claim 1 or a claim 2.

[Claim 4] The thin film magnetic head characterized by the width of face of the aforementioned lower part and up lead wire being larger than the width of face of the portion which laps with the magnetic core of the stripes-like electric conduction film of the aforementioned upper part and the lower part in a claim 3.

[Claim 5] It is the thin film magnetic head characterized by being allotted so that the aforementioned lower lead wire and up lead wire may lap through an insulating layer in a claim 3 or a claim 4.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the highly efficient thin film magnetic head which structure is easy and is easy to manufacture.

[0002]

[Description of the Prior Art] the former and thin film magnetic head — a substrate top — the thin film depositing method, photolithography technology, etc. — using — a magnetic core and a conductor — a coil is formed through an insulating layer and a miniaturization and highly-efficient-izing are easy compared with a conventional bulk type head the conventional thin film magnetic head is shown in drawing 7 — as — a lower magnetism core (4') top — an insulating layer (3'a) — minding — the shape of a spiral — a conductor — a coil (12') carries out covering formation — having — \*\*\*\* — this — a conductor — covering formation of the up magnetism core (6') is carried out through the insulating layer (3'b) on the coil the shape of an above spiral — a conductor — although the thin film magnetic head which has a coil (12') is easy to manufacture — a conductor — in case the area which a coil occupies becomes large and assembles a head, it is disadvantageous in respect of small mounting the shape of moreover, a spiral — a conductor — by using the high permeability nature of the magnetic core (4') (6') of the lower part and the upper part, the magnetic flux generated from the current which flows in a coil (12') serves as a component of the direction of y, and is led to a head gap (5') However, as shown in Hx of drawing 7, the magnetic fields with the coil at this time are x directions perpendicular to the film surface of the magnetic large core of an anti-magnetic field, and the quite big magnetomotive force to making a magnetic core reach to saturation is required for them. the shape of furthermore, a spiral — the rate of surface ratio of the portion with which the conductor (12') and the magnetic core (4') (6') have lapped — very — few — a conductor — if it sees from the point of the integrated state of a coil and a magnetic core — the conventional shape of a spiral of drawing 7 — a conductor — the structure of a coil is not desirable structure the shape of on the other hand, helical one as shown in drawing 8 — a conductor — the thin film magnetic head which has a coil (7'') — a conductor — the area which a coil occupies is small and it is suitable for small mounting moreover, a helical-like conductor — the magnetic field generated from the current which flows in a coil (7'') has turned to the direction of y in the film surface of the small up magnetism core (6'') of an anti-magnetic field, and can make a head gap (5'') generate sufficient magnetic field for magnetic recording in small magnetomotive force, as shown in Hy of drawing 8 the shape of furthermore, helical one — a conductor — with the coil, the rate of surface ratio of the portion to which a magnetic core laps with a coil is very large, and both joint efficiency has the big advantage of being very high however, the conductor of 1 turn — the complicated process of formation of a conductor layer, configuration processing by etching, formation of an insulating layer, and through hole processing is required to form a coil — a large number — the conductor of a volume — when producing a coil, as shown in a part for the electric joint of drawing 8 (9''), the small connection place of area increased, and it has been made into a fault for there to be a problem also in respect of reliability

[0003]

[Problem(s) to be Solved by the Invention] this invention is made in view of the fault of the above-mentioned conventional example, and it is suitable for mass-production nature, and aims at moreover offering the reliable thin film magnetic head.

[0004]

[Means for Solving the Problem] this invention carries out covering formation of the lower magnetism core on a substrate, and forms a lower stripes-like electric conduction film through an insulating layer on the aforementioned lower magnetism core. Form an up magnetism core through an insulating layer on the aforementioned lower stripes-like electric conduction film, and an up stripes-like electric conduction film is formed through an insulating layer on the aforementioned up magnetism core. In the thin film magnetic head in which a coil is formed the edge of the aforementioned lower stripes-like electric conduction film and an up stripes-like electric conduction film is connected — having — the shape of helical one — a conductor — the width of face for the electric joint which connects electrically the aforementioned lower stripes-like electric conduction film and the aforementioned up stripes-like electric conduction film — the shape of stripes of the aforementioned upper part and the lower part — a conductor — it is characterized by being larger than the width of face of the portion which laps with a membranous magnetic core

[0005]

[Function] According to the above-mentioned composition, since the lower part and an up stripes-like electric conduction film are electrically joinable in a big area as compared with a part for the electric joint of the conventional structure of drawing 8 (9''), the thin film magnetic head with the high reliability suitable for mass-production nature is realizable.

[0006]

[Example] Hereafter, the example of this invention is explained in detail, referring to a drawing. Drawing 1 (a) is the plan of the thin film magnetic head showing one example of this invention, and an A-A'B-B [ in / a plan (a) / in the cross section which met the line, and drawing 1 (c) ]' cross section / in / a plan (a) / in drawing 1 (b) ]. Among drawing, (1) is a substrate which consists of nonmagnetic ceramics, such as ferromagnetic oxide material, such as a Mn-Zn ferrite and a nickel-Zn ferrite, or glass ceramics, and covering formation of the lower magnetism core (2) which consists of high permeability magnetic thin films, such as a permalloy, a Sendust, and Co system amorphous magnetism alloy, is carried out on the upper surface of this substrate (1). On the aforementioned lower magnetism core, the lower stripes-like electric conduction film (4) of about 2-micrometer \*\* which consists of electrical conducting materials, such as Cu and aluminum, through the insulating layer (3a) which consists of an

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insulating material of SiO<sub>2</sub> grade is formed. On this lower stripes-like electric conduction film (4), the insulating layer (3b) of about 1-micrometer \*\* is formed. On the aforementioned insulating layer (3b), covering formation of the up magnetism core (5) which consists of a high permeability magnetic thin film is carried out. As shown in drawing, in order to form an efficient head gap (10), the aforementioned up magnetism core (5) is produced so that the nose of cam of a magnetic pole and the interval of a magnetic substrate may become narrow. It exposes to the same field as the end face of a substrate (1), and the end face of a lower magnetism core (2) and an up magnetism core (5) serves as a magnetic pole of a head gap (5). The other end of the aforementioned lower magnetism core (2) and an up magnetism core (5) is magnetically joined by the amount of [ by which an insulating layer (3) and (6) were removed ] (12) magnetic joint. On the aforementioned up magnetism core (5), the up stripes-like electric conduction film (7) is formed through about 1-micrometer insulating layer (6a). although the aforementioned lower part and an up stripes-like electric conduction film (4), and (7) \*\*\*\* an up magnetism core (5), they are mutual near the up magnetism core — it is alike, and an edge is not connected but it connects by part for the electric joint separated from the upper part and the lower magnetism core with the lower part and up lead wire (11') (11) (9) — having — the shape of helical one — a conductor — it becomes a coil By adopting such structure, a part for an electric joint (9) was able to be made into width of face as compared with the conventional structure of drawing 8, and was able to be taken to 16 or more times in 4 or more times and area. thereby — the shape of helical one — a conductor — the yield of a coil and the reliability of the thin film magnetic head improved by leaps and bounds Moreover, lower lead wire (11') and up lead wire (11) were carrying out the completely same configuration, and since the magnetic field generated by these two conductors was negated to each other and suited him, the increase in the inductance by having lengthened lead wire far away was able to be suppressed to minimum. Next, the manufacture method of the thin film magnetic head of the above-mentioned example is explained. First, covering formation of the lower magnetism core (2) is carried out by technology, such as vacuum evaporation, sputtering, and a photolithography, on the upper surface of a substrate (1). Next, an insulating layer (3a) is evenly formed in the upper surface of the substrate (1) equipped with the aforementioned lower magnetism core (2). Next, as shown in drawing 2, covering formation of — (9'p) is carried out by technology, such as a part for a lower stripes-like electric conduction film (4a) — (4h) lower lead-wire (11'a) — (11'p) lower joint (9'a), vacuum evaporation, sputtering, and a photolithography. under the present circumstances, the up stripes-like electric conduction film (7) with which the aforementioned lower stripes-like electric conduction film (4) is produced at a back process — lapping — the shape of helical one — a conductor — it is allotted so that it may become a coil Next, an insulating layer (3b) is evenly formed throughout the upper [ for the aforementioned lower stripes-like electric conduction film (4), lower lead wire (11'), and a lower joint (9') ]. Next, as shown in drawing 3, a through hole (14a) is produced by etching processing, and the front face of the lower magnetism core (2) used as a part for the aforementioned lower magnetic joint (12) is exposed. Moreover, processing for producing an efficient head gap is also performed. Next, covering formation of the up magnetism core (5) which carried out the almost same configuration as the aforementioned lower magnetism core (2) is carried out by technology, such as vacuum evaporation, sputtering, and a photolithography. The lower part and an up magnetism core are joined by part for this process and a magnetic joint (12). Next, an insulating layer (3a) is evenly formed throughout the upper surface containing the aforementioned up magnetism core (5). Next, as shown in drawing 4, a through hole (14b) is produced by etching processing, and a part for the aforementioned lower electric joint (9') is exposed. Next, as shown in drawing 5, covering formation of a part for an up stripes-like electric conduction film (7a) — (7h) up lead-wire (11a) — (11p) up electric joint — (9p) (9a) and the terminal (8a) (8b) is carried out by technology, such as vacuum evaporation, sputtering, and a photolithography. this joins electrically a part for a part for the aforementioned lower electric joint (9'), and the aforementioned up electric joint (9) — having — the aforementioned lower stripes-like electric conduction film (4) and the aforementioned electric conduction-on up stripes film (7) — electric — being connected — the shape of helical one — a conductor — it becomes a coil Next, as shown in drawing 1 (b) and (c), an insulating layer (6b) is formed in an all-over-the-districts front face for protection. One example of this invention is completed according to the above process. Drawing 6 (a) is the plan of the thin film magnetic head showing another example of this invention, and an A-A'B-B [ in / a plan (a) / in the cross section which met the line, and drawing 6 (c) ]' cross section / in / a plan (a) / in drawing 6 (b) ]. It is the substrate which consists of nonmagnetic ceramics, such as (1) glass ceramics, among drawing, and the lower stripes-like electric conduction film (4) of about 2-micrometer \*\* which consists of electrical conducting materials, such as Cu and aluminum, is formed in the upper surface of this substrate (1). The insulating layer which consists of an insulating material of SiO<sub>2</sub> grade on the aforementioned lower stripes-like electric conduction film (4) (3a) It minds and covering formation of the lower magnetism core (2) which consists of high permeability magnetic thin films, such as a permalloy, a Sendust, and Co system amorphous magnetism alloy, is carried out. On the aforementioned lower magnetism core, the insulating layer (3b) of about 1-micrometer \*\* is formed. On the aforementioned insulating layer (3b), the up stripes-like electric conduction film (7) is formed. On this up stripes-like electric conduction film (7), covering formation of the up magnetism core (5) which consists of a high permeability magnetic thin film through the aforementioned insulating layer (6a) is carried out. As shown in drawing, in order to form an efficient head gap (10), the aforementioned up magnetism core (5) is produced so that the nose of cam of a magnetic pole and the interval of a magnetic substrate may become narrow. It exposes to the same field as the end face of a substrate (1), and the end face of a lower magnetism core (2) and an up magnetism core (5) serves as a magnetic pole of a head gap (10). The other end of the aforementioned lower magnetism core (2) and an up magnetism core (5) is magnetically joined by the amount of [ by which an insulating layer (3) and (6) were removed ] (12) magnetic joint. the aforementioned lower part and an up stripes-like electric conduction film (4), and (7) \*\*\*\* a lower magnetism core (5), and, as for the point that this example of drawing 6 differs from the last example of drawing 1, they are mutual near the lower magnetism core — it is alike, and an edge is not connected but it connects by part for the electric joint separated from the upper part and the lower magnetism core with the lower part and up lead wire (11') (11) (9) — having — adopting such structure — a front example — the same — the shape of helical one — a conductor — the yield of a coil and the reliability of the thin film magnetic head improved by leaps and bounds Since the width of face of the part for an electric joint and lead wire which are the basic matters of the claim of this invention includes the matter of being larger than the width of face of the portion which laps with the magnetic core of an electric conduction-on stripes film, if this example is the expert of this field, it will be able to understand it easily that the above-mentioned example is included in the range of this invention.

[0007]

[Effect of the Invention] According to this invention, as compared with structure, manufacture is conventionally easy, and the thin film magnetic head of the high-reliability suitable for mass-production nature can be offered.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** The plan and cross section of the thin film magnetic head

**[Drawing 2]** The plan showing the manufacture method of the thin film magnetic head

**[Drawing 3]** The plan showing the manufacture method of the thin film magnetic head

**[Drawing 4]** The plan showing the manufacture method of the thin film magnetic head

**[Drawing 5]** The plan showing the manufacture method of the thin film magnetic head

**[Drawing 6]** The important section plan showing other examples of the thin film magnetic head

**[Drawing 7]** The conventional plan and conventional cross section of a thin film head.

**[Drawing 8]** The conventional plan and conventional cross section of a thin film head.

**[Description of Notations]**

1 Substrate

2 Lower Magnetism Core

3 Insulating Layer

4 Lower Stripes-like Electric Conduction Film

5 Up Magnetism Core

6 Insulating Layer

7 Up Stripes-like Electric Conduction Film

7' the shape of helical one — a conductor — coil

8 Terminal

9 A Part for Electric Joint

10 Head Gap

11 Lead Wire

12 A Part for Magnetic Joint

12' the shape of a spiral — a conductor — coil

13 Substrate End Face

14 Through Hole

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